CLAIMS

What is claimed is:

1. A method of operating a fuel cell system, the fuel cell system comprising an enclosure and a fuel cell stack disposed inside the enclosure, the method comprising:

supplying fuel to the stack via an anode inlet;

supplying oxidant to the enclosure;

circulating the oxidant within the enclosure to mix with any fuel present in the enclosure;

withdrawing circulated oxidant from the enclosure; and

supplying at least a portion of the circulated oxidant withdrawn from the enclosure to the stack via a cathode inlet.

2. The method of claim 1, wherein the oxidant supplied to the enclosure is ambient air.

3. The method of claim 1, further comprising monitoring a fuel concentration in the enclosure.

4. The method of claim 3, further comprising increasing the supply of oxidant to the enclosure when the monitored fuel concentration exceeds a predetermined level.

5. The method of claim 1, wherein supplying oxidant to the enclosure comprises varying the amount of oxidant supplied depending on at least one operational parameter of the fuel cell system.

6. The method of claim 1, further comprising recycling a portion of a fuel exhaust stream to the anode inlet.

7. The method of claim 1, further comprising recycling at least a portion of an oxidant exhaust stream to the cathode inlet.

8. The method of claim 1, further comprising venting an oxidant exhaust stream outside of the enclosure.

9. The method of claim 1, further comprising venting at least a portion of an oxidant exhaust stream to the enclosure.

10. The method of claim 1, further comprising venting at least a portion of a fuel exhaust stream to the enclosure.

11. The method of claim 10, wherein the portion of the fuel exhaust stream is continuously vented to the enclosure.

12. The method of claim 10, wherein the portion of the fuel exhaust stream is periodically vented to the enclosure.

13. The method of claim 12, wherein the portion of the fuel exhaust stream is vented to the enclosure dependent on at least one fuel cell operating parameter.

14. The method of claim 12, wherein the portion of the fuel exhaust stream is vented at predetermined intervals.

15. The method of claim 1, wherein the fuel cell stack comprises a solid polymer electrolyte membrane fuel cell.

16. The method of claim 1, wherein the fuel cell system further comprises a purging device, the purging device comprising a retention vessel comprising an inlet and an outlet, and wherein the method further comprises drawing an

amount of fuel exhaust into the purging device via the inlet in a first mode and expelling the fuel exhaust out of the purging device via the outlet in a second mode.

17. The method of claim 16, wherein a duration of the first mode is shorter than a duration of the second mode.

18. The fuel cell system of claim 16, wherein a duration of the first mode is between about 1 and 3 seconds.

19. The fuel cell system of claim 16, wherein a duration of the second mode is between about 60 and 90 seconds.

20. A fuel cell system comprising:

a fuel cell stack comprising a fuel supply passage and an oxidant supply passage;

the fuel supply passage comprising an anode inlet for directing a fuel stream to the fuel cell stack;

the oxidant supply passage comprising a cathode inlet for directing an oxidant stream to the fuel cell stack; and

an enclosure disposed around the fuel cell stack, the enclosure comprising

an enclosure inlet passage in fluid communication with the interior of the enclosure for introducing oxidant into the enclosure; and

an enclosure outlet passage fluidly connected to the cathode inlet, for directing oxidant out of the enclosure and to the cathode inlet.

21. The fuel cell system of claim 20, further comprising a circulation device configured to introduce oxidant into the enclosure inlet passage.

22. The fuel cell system of claim 21, wherein the circulation device is disposed upstream of the enclosure inlet passage.

23. The fuel cell system of claim 21, wherein the circulation device is disposed downstream of the enclosure inlet passage.

24. The fuel cell system of claim 21, wherein the circulation device is disposed outside of the enclosure.

25. The fuel cell system of claim 24, wherein the circulation device is disposed in the enclosure outlet passage.

26. The fuel cell system of claim 21, wherein the circulation device is selected from the group consisting of a blower, a pump and a fan.

27. The fuel cell system of claim 21, further comprising a variable speed motor associated with the circulation device.

28. The fuel cell system of claim 20, wherein the fuel supply passage is closed.

29. The fuel cell system of claim 28, wherein the fuel supply passage is dead-ended.

30. The fuel cell system of claim 28, wherein the fuel supply passage comprises a fuel recirculation system for recycling at least a portion of a fuel exhaust stream.

31. The fuel cell system of claim 20, wherein the fuel supply passage further comprises an anode outlet for directing at least a portion of a fuel exhaust stream to the interior of the enclosure.

32. The fuel cell system of claim 31, wherein the anode outlet comprises a purging device.

33. The fuel cell system of claim 32, wherein the purging device comprises a valve.

34. The fuel cell system of claim 32, wherein the purging device comprises a retention vessel comprising an inlet and an outlet, and the purging device comprises means for drawing an amount of fuel exhaust into the purging device via the inlet when operated in a first mode and for expelling the fuel exhaust out of the purging device via the outlet when operated in a second mode.

35. The fuel cell system of claim 34, wherein the means for drawing an amount of fuel exhaust into the purging device via the inlet when operated in a first mode and for expelling the fuel exhaust out of the purging device via the outlet when operated in a second mode comprises a plunger disposed inside the retention vessel.

36. The fuel cell system of claim 20, wherein the oxidant supply passage is configured to direct an oxidant exhaust stream out of the enclosure.

37. The fuel cell system of claim 20, wherein the oxidant supply passage is configured to vent at least a portion of the oxidant exhaust stream to the interior of the enclosure.

38. The fuel cell system of claim 20, further comprising a sensor disposed within the enclosure for determining a concentration of fuel in the enclosure.

39. The fuel cell system of claim 38, wherein the sensor is a flammable gas sensor.

40. The fuel cell system of claim 20, wherein the fuel cell stack comprises a solid polymer electrolyte membrane fuel cell.

41. A vehicle comprising the fuel cell system of claim 20.

42. A fuel cell system comprising:

an enclosure;

a fuel cell stack disposed within the enclosure;

a means for directing a fuel stream to the stack;

a means for supplying air to the enclosure; and

a means for withdrawing an oxidant stream from the interior of the enclosure and supplying the oxidant stream to the stack.

43. A purging device for a fuel cell system, comprising a retention vessel comprising an inlet, an outlet and means for drawing an amount of fuel exhaust into the purging device via the inlet when operated in a first mode and for expelling the fuel exhaust out of the purging device via the outlet when operated in a second mode.

44. The purging device of claim 43, wherein the means for drawing an amount of fuel exhaust into the purging device via the inlet when operated in a first mode and for expelling the fuel exhaust out of the purging device via the outlet when operated in a second mode comprises a plunger disposed inside the retention vessel.

45. The purging device of claim 44, wherein the plunger is operated by a motor.

46. A fuel cell system comprising the purging device of claim 0, wherein a volume of the retention vessel is greater than a process fuel system volume.

47. The fuel cell system of claim 46, wherein the volume of the retention vessel is between about 25 and 50 percent greater than the process fuel system volume.